

Hydrogen Fuel Capability Added to Combustor Flametube Rig

Facility capabilities have been expanded at Test Cell 23, Research Combustor Lab (RCL23) at the NASA Glenn Research Center, with a new gaseous hydrogen fuel system. The purpose of this facility is to test a variety of fuel nozzle and flameholder hardware configurations for use in aircraft combustors. Previously, this facility only had jet fuel available to perform these various combustor flametube tests. The new hydrogen fuel system will support the testing and development of aircraft combustors with zero carbon dioxide (CO₂) emissions. Research information generated from this test rig includes combustor emissions and performance data via gas sampling probes and emissions measuring equipment.

The new gaseous hydrogen system is being supplied from a 70 000-standard-ft³ tube trailer at flow rates up to 0.05 lb/s (maximum). The hydrogen supply pressure is regulated, and the flow is controlled with a ½-in. remotely operated globe valve. Both a calibrated subsonic venturi and a coriolis mass flowmeter are used to measure flow. Safety concerns required the placement of all hydrogen connections within purge boxes, each of which contains a small nitrogen flow that is vented past a hydrogen detector. If any hydrogen leaks occur, the hydrogen detectors alert the operators and automatically safe the facility.

Facility upgrades and modifications were also performed on other fluids systems, including the nitrogen gas, cooling water, and air systems. RCL23 can provide nonvitiated heated air to the research combustor, up to 350 psig at 1200 °F and 3.0 lb/s. Significant modernization of the facility control systems and the data acquisition systems was completed. A flexible control architecture was installed that allows quick changes of research configurations. The labor-intensive hardware interface has been removed and changed to a software-based system. In addition, the operation of this facility has been greatly enhanced with new software programming and graphic operator interface stations. Glenn's RCL23 facility systems were successfully checked out in the spring of 2002, and hydrogen combustor research testing began in the summer of 2002.

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